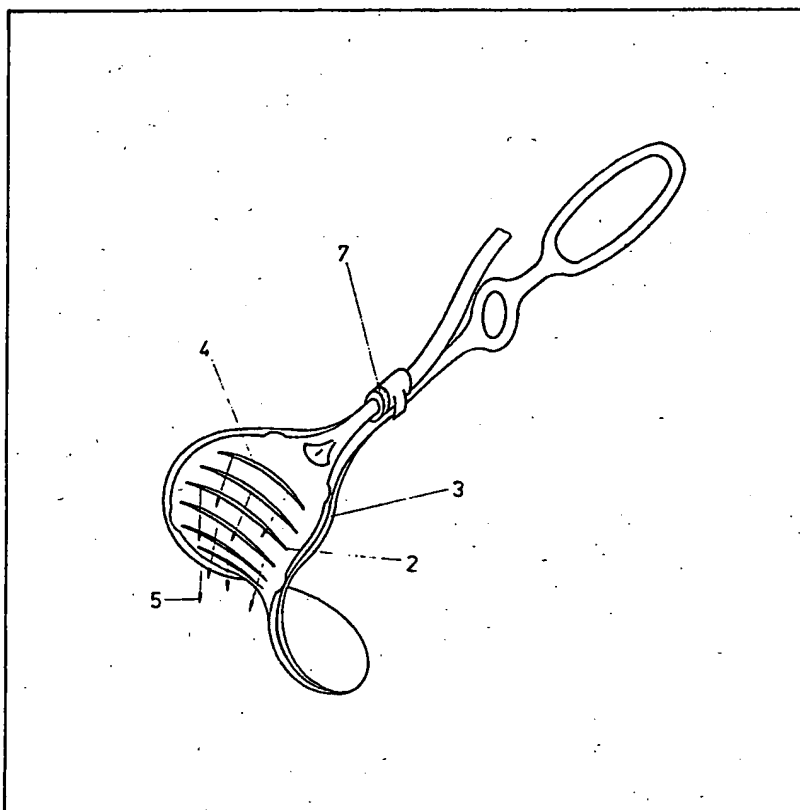


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(54) **Improvements in or relating to surgical retractors**

(57) A retractor for surgical purposes is directly associated with illumination means so that radiation is aimed in the direction towards the area of the wound. The retractor may be at least partially formed by a light-conducting material. In one embodiment a light-conductor attachment is attached to a frame 3 of the retractor. A coupling element 7 may be provided for coupling to a source of radiation such as light or ultraviolet radiators for sterilisation of the air above the wound. If desired, provision may be made for supplying substantially sterile air.



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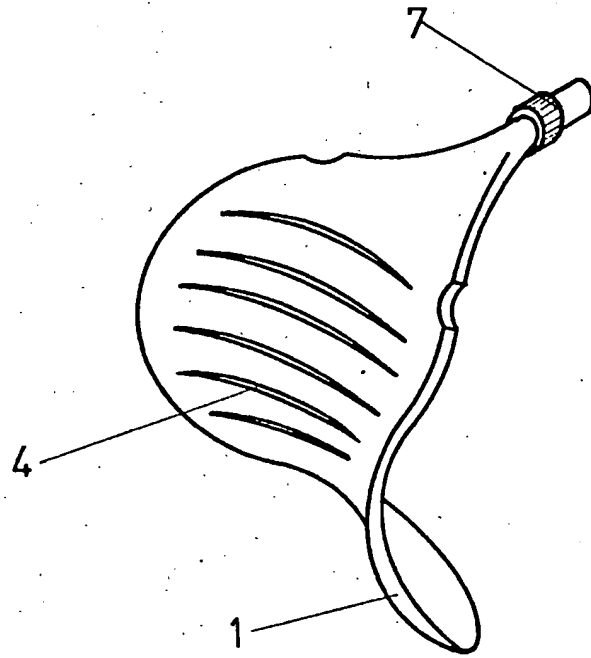
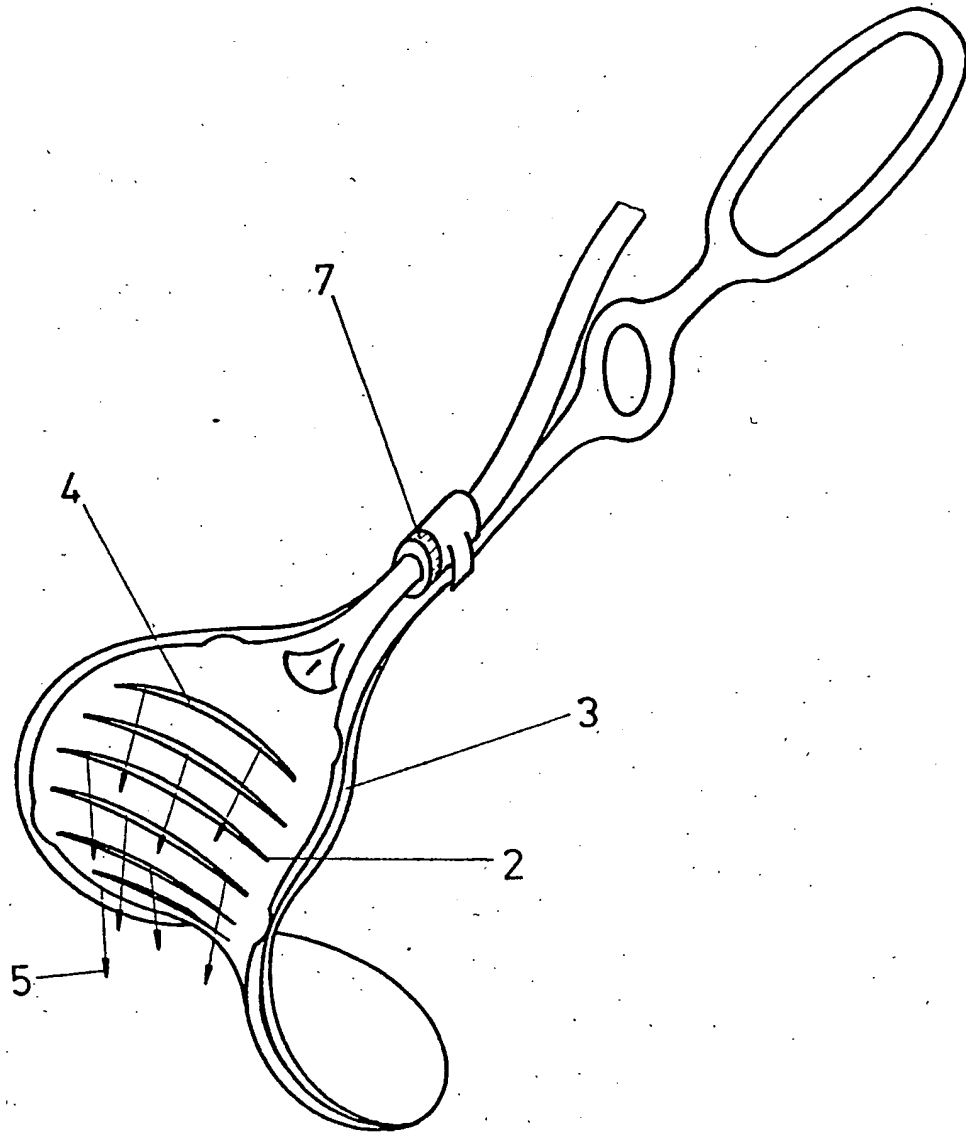


Fig. 1

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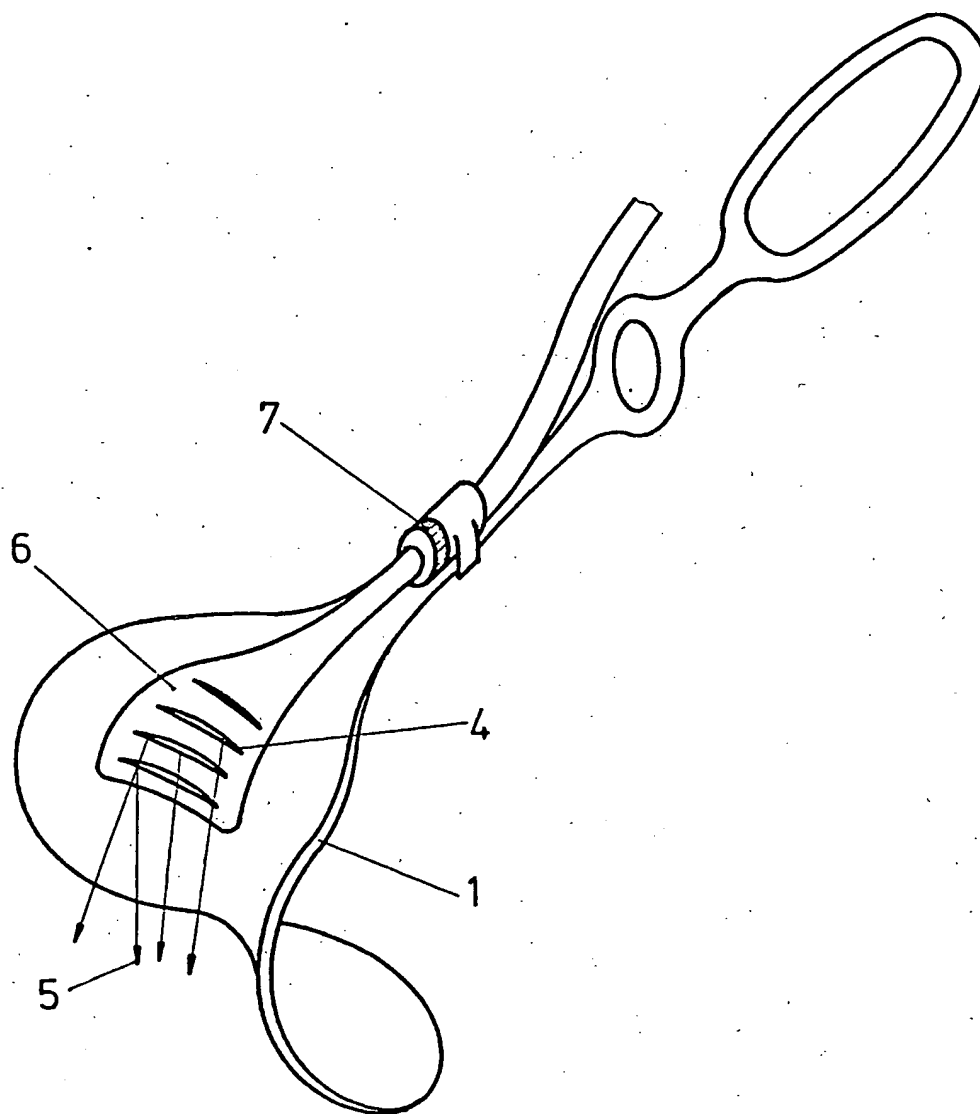


Fig. 3

SPECIFICATION

Improvements in or relating to surgical retractors

5 The present invention relates to surgical retractors, sometimes referred to as wound hooks, which are used by surgeons, e.g. for holding apart skin and tissue areas separated by an incision, to allow of undisturbed working in the area of a surgical operation.

10 Known retractors are made from various metals since they must have an adequate mechanical strength, be sterilisable by heat and toxicologically safe.

15 It is known that the operating theatre, as well as the area of operation in particular, should be illuminated as intensively as possible to prevent forming shadows of greater or lesser intensity by means of the surgeon's or assistants' hands and instruments.

20 German Patent Specification O.S. 22 29 683, describes a retractor in which a light ducting unit is provided which is flexible and may be aimed at the base area in different directions of incidence.

Unfortunately, it has been discovered in practice 25 that the intended users make comparatively little use of this facility, since the proximity of the light conductor extremity to the area of operation may disturb the surgeon subjectively.

It is an object of the invention to provide means 30 whereby illumination is possible which is only affected to a small extent by shadowing for an area of operation, without placing complementary lighting elements in the actual region of that area.

Accordingly, the invention consists in a surgical 35 retractor which is directly associated with illumination means whereby light can be directed towards an area of operation by directing the retractor itself.

Constructions according to the invention have the advantage of providing a more satisfactory illumination of an area of operation without complementary obstructive elements in proximity to the wound. An illumination less obstructed by shadows and an improved identifiability of surface structures even within deep operation wounds, become possible by 45 virtue of the incidence of light at greater angles of incidence.

Plastic materials, e.g. such as a glass-like acrylic plastic, may be utilised for light-conducting inserts or attachment of light conducting material. A light 50 conductor of this nature may easily be manufactured for once-only use. This also applies where the retractor as a whole is formed from light-conducting material. A light-conducting retractor of this kind is advantageously connected via a coupling member 55 to a light conductor of the fibre or liquid types, which for its part is connected to a source of radiation. The radiation which is to be transmitted may be visible radiation as well as ultraviolet radiation. In addition to the radiation, it is also possible to supply sterile 60 air, in particular ultra-pure "laminar" air, from a source of the same.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show certain embodiments thereof by way of example and in which:-

Figure 1 shows a retractor made wholly of light-conductive material.

Figure 2 shows a retractor comprising a light-conductive insert, and

70 Figure 3 shows a retractor comprising a light-conducting attachment.

Referring now to the drawings, in the embodiment according to Figure 1, a retractor as a whole is manufactured from a light-conducting material, e.g. such 75 as Perspex (R.T.M.). This material has a refractive index $n = 1.5$. This is why all the light rays travelling within the material and striking the Perspex/air boundary layer at an angle of incidence of $\geq 41^\circ$, undergo total reflection into the inside of the material. An emergence of light is possible however only 80 below the limiting angle, which becomes possible by appropriate light guiding and configuration of the light-conducting element or by roughening its surface in the area in which an emergent radiation is desirable. The radiation then issues from the retractor in the roughened portion, in the direction in which the area of operation is normally situated. The term "roughened" is intended to denote any kind of structuring of the surface, be it by chemical, mechanical, physical or other means, provided that the same 90 is capable of deflecting the emergent rays in the direction required.

The retractor 1 is intended to be gripped in a handle and for connection via light conductors to a 95 source of radiation.

Figure 2 illustrates an embodiment in which the retractor comprises a frame 3 manufactured from conventional material but is provided with a light-conducting insert 2 in its area generally confronting the wound (central area). Roughened or structured surface areas are provided as indicated at 4. The emergence of light rays is denoted by arrows 5. Like the attachment according to Figure 3, the light-conductor insert may be connected releasably or 100 fixedly to the metal retractor. It is supplied as a throw-away product, in a sterile pack. The attachment is denoted by 6 in Figure 3, and the references otherwise correspond to those of the preceding Figures. The insert or attachment may be affixed to the 110 handle of the retractor 1 by means of a clip, e.g. in elastically springy manner. A coupling element 7 serves the purpose of establishing a mechanical or optical coupling to a light conductor of the fibre or liquid type which is connected to the said source. 115 The coupling element is advantageously constructed as a lens system to act as a collimator. If desirable, it is possible to utilise a cylindrical lens for the incident radiation into the plastics material area of the retractor.

At the same time as, or instead of the visible radiation, ultraviolet radiation may also be supplied into the air volume actually above the area of operation for germicidal action, to promote healing, and also together with substantially sterile air, e.g. via an air supply hose surrounding the light conductor. Use 125 may be made, for example, of a glass-like acrylic plastics material, for the transmission of light and UV-A and partially also UV-B. An embodiment of the light-conducting elements in the form of fused silica for example, is advantageous for transmission of 130

UV-C. A sterilisation is then also possible above 100°C, for example at approximately 135°C.

CLAIMS

1. A surgical retractor which is directly associated with illumination means whereby light can be directed towards an area of operation by directing the retractor itself.
2. A surgical retractor as claimed in claim 1 which is at least partially made from a light-conducting material.
3. A surgical retractor as claimed in claim 1, wherein a light conductor is connected directly thereto.
4. A surgical retractor as claimed in claim 2, wherein comprises a metal frame containing a light-conducting insert.
5. A surgical retractor as claimed in claim 3, which is made from metal and has a light-conducting device attached thereto.
6. A surgical retractor as claimed in claims 4 or 5, wherein a light-conducting surface facing towards the wound area is so structured that the radiation travels at least partially below the limiting angle of total reflection.
7. A surgical retractor as claimed in any of the preceding claims, which comprises a coupling element for coupling in mechanical and optical manner to a light conductor of the fibre or liquid types, which latter is connected to a source of radiation.
8. A surgical retractor as claimed in claim 7, wherein the coupling element contains a collimator for incident radiation into the areal light-conducting hook section.
9. A retractor as claimed in any of the preceding claims, wherein the illumination means are also arranged for transmitting or supplying ultraviolet radiation for sterilisation of the air above a wound or for direct irradiation of a wound with ultraviolet radiation.
10. A surgical retractor as claimed in any of the preceding claims, which includes outlets for direction at a wound area, of passages arranged for supply of substantially sterile air, in particular ultra-pure air, in laminar piston flow from a source.